Dome and Little Eldorado creeks are relatively inaccessible to people and fish surveys of these drainages have not been done. Some of the above species, however, may be present in these streams.

3.12 WILDLIFE

The True North project area lies within six miles of the Fort Knox Mine and is composed of very similar habitat. Thus, bird and mammal species and distributions are likely to be very similar. The following descriptions are largely based on information contained in the Fort Knox Mine EA (FGMI, 1993), augmented by observations made by ABR, Inc. during its 1995 to 1998 threatened and endangered species studies in the True North project area (Anderson et al., 1995, 1996, 1997, 1998).

3.12.1 BIRDS

Avian habitat in the project area is typical of upland areas of interior Alaska. According to the Kessel habitat classification system (Kessel, 1979), project area habitats include medium- and tall-shrub thickets, broadleaf forest, coniferous forest, mixed broadleaf- coniferous forest, scattered woodland, and artificial habitat (Dames & Moore, 1991). Spindler and Kessel (1980) studied bird habitat use in detail in parts of the upper Tanana River Valley and recorded habitats similar to those of the True North project area. Bird species documented from that study as well as species documented in the nearby Fort Knox project area are listed in Table 3.12-1.

Passerines. Spindler and Kessel (1980) documented a total of 36 species of passerines birds in terrestrial habitats of the Upper Tanana River Valley. Of these birds, 24 species have been recorded in the Fort Knox project area (Dames & Moore, 1991). Although the number of observations was insufficient to delineate habitat affinities, riparian tall-shrub communities are obviously important passerine habitat (Dames & Moore, 1991).

Waterbirds. Waterbird habitat in the project area is very limited because there are no naturally occurring lakes or large ponds. Existing habitat is very limited and primarily confined to old settling ponds and impoundments related to placer mining.

Raptors. Four species of raptors were documented in the nearby Fort Knox project area (FGMI, 1993) and are very likely found in the True North project area. These were the Northern Goshawk, Sharp-shinned Hawk, Great Horned Owl, and Red-tailed Hawk (Harlan's Hawk). The Red-tailed Hawk was the most commonly sighted raptor. Nesting Northern Goshawks were seen on the True North project area, and active nests were documented by Anderson et al. (1998). The Northern Goshawk is considered a sensitive species across its range in Alaska and is discussed below in Section 3.13 (Threatened and Endangered Species).

3.12.2 MAMMALS

The project area supports a mammalian fauna typical of upland taiga habitats of interior Alaska. Mammals common to this area are listed in Table 3.12-2.

Small mammals. The red squirrel (*Tamiasciurus hudsonicus*) is common throughout the project area in habitats with a substantial spruce component, such as the mixed-forest and needleleaf woodland habitat.

Beavers (*Castor canadensis*) may be present in small numbers in Dome and Eldorado creeks, likely at the mouths of old placer mining settling ponds, and perhaps across the main stream channel of these streams. Dams would occur in areas of low stream gradient. Trapping is unlikely to influence population size because the area is accessible by road.

Snowshoe hares (*Lepus americanus*) are common and are distributed throughout upland habitats, especially in riparian tall-shrub and mixed broadleaf-coniferous forest (Dames & Moore, 1991). Abundance of this species is cyclical and may change considerably over time. Anderson et al. (1998) reported that snowshoe hare numbers in the True North project area have increased since 1997, and appear to be following the regional trend of increasing hare population in interior Alaska (Taylor, 1996).

Table 3.12-1

Bird species of Alaska taiga in the upper Tanana Valley and the True North project area

Species	Upper Tanana	True North project area
Mallard	x	x
Pintail	x	x
Green-winged Teal	x	x
Bufflehead	x	x
Sharp-shinned Hawk	x	x
American Kestrel	x	—
Spruce Grouse	x	x
Ruffed Grouse	x	—
Sandhill Crane	x	—
Common Snipe	x	x
Solitary Sandpiper	x	—
Spotted Sandpiper	x	x
Lesser Yellowlegs	x	—
Great Horned Owl	x	x
Hawk Owl	x	—
Belted Kingfisher	x	x
Common Flicker	x	x
Hairy Woodpecker	x	—
N. Three-toed Woodpecker	x	—
Alder Flycatcher	x	x
Hammond's Flycatcher	x	—
Olive-sided Flycatcher	x	x
Violet-green Swallow	x	—
Tree Swallow	x	x
Bank Swallow	x	x
Cliff Swallow	x	—
Gray Jay	x	x
Common Raven	x	x
Black-capped Chickadee	x	x
Boreal Chickadee	x	—
Brown Creeper	x	x
American Robin	x	x
Varied Thrush	x	x
Hermit Thrush	x	x
Swainson's Thrush	x	x
Gray-checked Thrush	x	x
Ruby-crowned Kinglet	x	x
Water Pipit	—	x
Bohemian Waxwing	x	—
Orange-crowned Warbler	x	x
Yellow Warbler	x	x

Table 3.12-1 (cont'd)

Bird species of Alaska taiga in the upper Tanana Valley and the True North project area

Species	Upper Tanana	True North project area
Yellow-rumped Warbler	x	X
Townsend's Warbler	x	—
Blackpoll Warbler	x	—
Northern Waterthrush	x	—
Wilson's Warbler	x	x
Rusty Blackbird	x	—
Pine Grosbeak	x	—
Common Redpoll	x	x
Savannah Sparrow	x	x
Dark-eyed Junco	x	x
Tree Sparrow	x	x
White-crowned Sparrow	x	x
Fox Sparrow	x	x
Lincoln's Sparrow	x	x

Source: Spindler and Kessel, 1980; Dames & Moore, 1991a.

Table 3.12-2

Common mammal species of interior Alaska and the True North project area

Species	Scientific Name
Shrew	*Sorex* spp.
Voles, mice, and lemmings	Clethrionomys rutilus, Microtus spp., Synaptomys borealis, and Lemmus trimucronatus
Northern flying squirrel	Glaucomys sabrinus
Red squirrel	Tamiasciurus hudsonicus
Snowshoe hare	Lepus americanus
Beaver	Castor Canadensis
Porcupine	Erethizon dorsatum
Ermine	Mustela erminea
Marten	Martes Americana
Mink	Mustela vison
Wolverine	Gulo gulo
Coyote	Canis latrans
Red fox	Canis vulpes
Wolf	Canis lupus
Lynx	Felis lynx
Black bear	Ursus americanus
Brown bear	Ursus arctos
Moose	Alces alces

Source: ADFG 1973; Hall, 1981; Beasely, 1990; McNay, 1990; Dames & Moore, 1991.

Large mammals. Black bears (*Ursus americanus*) are likely to be seen in any habitat during the spring, summer, or fall (ADFG, 1973; America North, Inc., 1991; Dames & Moore, 1991). Black bears avoid open areas and extensive areas of dense timber, preferring open forest habitats that provide cover and food species such as berries, succulent forbs, and grasses (USFWS, 1980; Modaferri, 1978). Carrion and human refuse also are used when available (Hatler, 1967). Territories of individual bears vary considerably in size, depending on abundance of food, cover, and topography; for example, on the basis of the Kenai Peninsula studies (Schwartz and Franzmann, 1980), sows with cubs use from 9 square kilometers (3.5 square miles) to 26 square kilometers (10 square miles) and adult males use as much as 52 square miles (134.7 square kilometers).

Brown bears (*Ursus arctos*) are less common in the project area than black bears, but do occur in small numbers in the region (Dames & Moore, 1991). Brown bears can be found in any habitat type, but prefer open areas. They are typically solitary animals (USFWS, 1980). Isolation from human disturbance is an important factor in brown bear habitat use. Territories of brown bears are substantially larger than those of black bears, and range from 9.3 square miles to 14.7 square miles (Dean, 1957).

The moose (*Alces alces*) is the most abundant large game species in the project area. The lower valley bottoms are winter moose concentration areas (ADFG, 1973. McNay, 1990). Moose reside in the project area throughout the year. Most use occurs during the winter, but in areas lower than the proposed mine site (Young, 2000). Many of the moose that winter in the lower project area move to still lower elevations each spring and calve in the Chatanika River flats, remaining in lowland habitats until fall. By late October, moose have moved to higher elevations in the foothills around Fairbanks, including lower portions of project area, where they winter (McNay, 1990).

Based on browse transects in similar habitats in the Fort Knox project area, winter habitat use by moose would be greatest in the riparian tall-shrub communities along the stream courses, especially in revegetated tailing piles and old overgrown settling at elevations below the proposed mine site. Habitats with a lower value for wintering moose would be the closed mixed-forest and the needleleaf woodlands generally at higher elevations. Availability of browse species in these habitats, primarily willows (*Salix* spp.), is low, but moose likely would use a substantial proportion of what is available (Dames & Moore, 1991).

Data from browse transects at Fort Knox indicate that moose use essentially all available habitat types during the winter months. The major browse species were the feltleaf willow (*Salix alexensis*), diamondleaf willow (*S. planifolia*), grayleaf willow (*S. glauca*), and to a lesser extent, littletree willow (*S. arbusculoides*) and Bebb willow (*S. bebbiana*) (Dames & Moore, 1991a).

Browse becomes less important in a moose's diet as herbaceous vegetation becomes available in spring and summer (LeResche et al., 1974).

According to historical records (Murie, 1935), the project area is within the range of the Fortymile caribou herd (*Rangifer tarandus*). In the past, this herd was substantially larger (Skoog, 1956; Hemming, 1974). The closest caribou from the herd have come to the project area in recent years is approximately 30 miles to the east (McNay, 1990). In the winter of 1992-1993, several hundred caribou from the Delta caribou herd moved through Fairbanks proper and the surrounding area. Less than a dozen individuals are thought to have passed through the nearby Fort Knox project area. This is the first recordation in decades of members of this herd ranging this far to the northwest (FGMI, 1993).

The project area lies within Game Management Unit 20 B, and ADFG uniform coding unit (UCU) 208 that includes the watershed of the Chatanika River from Hard Luck Creek, approximately 10 miles west of Murphy Dome, upriver to the vicinity of Captain Bluff Camp, approximately 8 miles north-northeast of Cleary Summit.

Moose, beaver and lynx are the most common wildlife species harvested in UCU 208. ADFG moose harvest records for all of UCU 208 show a recent take of 27 (1997-98), 46 (1998-99) and 40 (1999-00). In 1997-98 and 1998-99, a combined total of 10 beavers was taken, as well as 39 lynx. Other species harvested included: black bear --13 (1995-96), 7 (1996-97), and 19 (1997-98); brown bear -- 1 in defense of life and property (1997-98); and 1 otter and 1 wolf in the two-year period 1998-99 to 1999-00.

UCU 208 encompasses an area of 353 square miles while all of the Dome and Little Eldorado creek drainages, within which the proposed project is located, cover approximately 30 square miles, or less than ten percent. Thus, although the actual location of the proposed project may host some hunting and trapping, it likely does not contribute a significant portion of the harvest in the UCU 208 area of the Chatanika River drainage.

3.13 THREATENED AND ENDANGERED SPECIES

Table 3.13-1 presents a list of the status and distribution of threatened and endangered species, and species of concern, in Alaska. Excluding marine mammals, only five species currently are listed as threatened or endangered in Alaska under the Endangered Species Act (ESA). One species is proposed for endangered status, and one species, the American Peregrine Falcon (*Falco peregrinus anatum*), was "delisted" in August of 1999. None of these species is found in the True North project area.

Prior to 1996, the U. S. Fish and Wildlife Service (USFWS) also maintained lists of candidate species (in two categories) that, although not formally listed under the ESA, were under consideration for future listing. In February 1996, the USFWS reorganized the listing procedure and now maintains a single category of candidate species, which is defined as species that warrant listing based on the available scientific data (i.e., only those species previously on the Category 1 [C1] list). Only one species in Alaska is currently a proposed species, the Short-tailed Albatross (Table 3.13-1). Species formerly listed on the Category 2 (C2) list are now considered ”species of concern” under the new system. A species of concern is one for which the USFWS has available scientific information that indicates populations may be declining or facing threats (USFWS, 1996). Although these species are not legally protected under the ESA, the USFWS does monitor their status, and “…encourages surveys and research on these species and implementation of management practices that would stop population declines and/or alleviate threats in order to preclude the need for listing” (USFWS, 1996).

Of the 31 species of animals and plants in Alaska listed as species of concern, 9 are known to occur in interior Alaska (Table 3.13-1): 1 mammal: lynx (*Felis lynx canadensis*); 3 birds: Peregrine Falcon (*Falco peregrinus anatum),* Harlequin Duck (*Histrionicus histrionicus*), and Olive-sided Flycatcher *(Contopus cooperi*); and 5 plants: (*Aster yukonensis*, *Cryptantha shackletteana*, *Draba murrayi*, *Eriogonum flavum* var. *aquilinum*, and *Podistera yukonensis*).

Table 3.13-1.
Status and distribution of threatened and endangered species and species of concern in Alaska

Status /Taxonomic Group / Species [1]	Range in Alaska
ENDANGERED SPECIES	
Plants	
Aleutian shield fern (*Polystichum aleuticum*)	Adak Island
THREATENED SPECIES	
Aleutian Canada Goose (Branta canadensis leucopareia)	Aleutian and Semidi islands
Spectacled Eider (*Somateria fischeri*)	Western and Northern (coastal)
Steller's Eider (Polysticta stelleri)	Southwestern, Western, & Northern
PROPOSED ENDANGERED	
Short-tailed Albatross (*Diomedea albatrus*)	Gulf of AK, Aleutian Is., Bering Sea
SPECIES OF CONCERN [2]	
Mammals	
Glacier Bay water shrew (*Sorex alaskanus*)	Glacier Bay
Pribilof Islands shrew (*Sorex hydrodromus*)	Pribilof Islands
Amak tundra vole (Microtus oeconomus amakensis)	Amak Island
Montague tundra vole (Microtus oeconomus elymocetes)	Montague Island
North American lynx (*Felis lynx canadensis*)	Statewide
Alexander Archipelago wolf (*Canis lupus ligoni*)	Southeast
Birds	
Perigrine Falcon (Falco peregrinus anatum)	Stateside
Harlequin Duck (Histrionicus histrionicus)	Statewide
Northern (Queen Charlotte) Goshawk (*Accipiter gentilis laingi*)	Southeast
Bristle-thighed Curlew (*Numenius tahitiensis*)	Western
Red-legged Kittiwake (*Rissa brevirostris*)	Pribilof, Buldir, and Bogoslof Is.
Evermann's Rock Ptarmigan (*Lagopus mutus evermanni*)	Attu Island
Yunaska Rock Ptarmigan (*Lagopus mutus yunaska*)	Yunaska I.
Kittlitz's Murrelet (Brachyramphus brevirostris)	South and Southeast
Marbled Murrelet (Brachyramphus marmoratus)	South and Southeast

Table 3.13-1 (con'td)

Status and distribution of threatened and endangered species and species of concern in Alaska

Status /Taxonomic Group / Species [1]	**Range in Alaska**
Olive-sided Flycatcher (*Contopus cooperi*)	Central, Southern, and Southeast
Amphibians	
Spotted frog (*Rana pretiosa*)	Southeast
Fish	
Bull trout (Salvelinus confluentus)	Southeast
Plants	
Artemisia globularia var. lutea	St. Paul I., St. Matthew I.
Aster yukonensis	Bettles area
Botrychium ascendens	Southeast and Southcentral
Carix lenticularis var dolia	Southeast
Cryptantha shackletteana	Eagle area
Draba murrayi	Eagle area
Eriogonum flavum var. aquilinum	Eagle area
Mertensia drummondii	Atqasuk/Umiat area
Oxytropis arctica var. barnebyana	Kotzebue area
Podistera yukonensis	Eagle area
Primula tschuktschorum	Western Seward Peninsula
Rumex krausei	Point Hope area, W. Seward Pen.
Smelowksia pyriformis	Upper Kuskokwim River
Taraxacum carneocoloratum	Southcentral, including AK Penin.

1 Species in bold occur in interior Alaska.

2 Species of concern are from USFWS (1996).

Although only the Queen Charlotte population (found in Southeast Alaska) of Northern Goshawks is listed as a species of concern, the goshawk is considered to be a sensitive species across its range in Alaska.

There are no listed threatened or endangered species of fish in Alaska and only one species of concern, in southeast Alaska.

From 1995 to 1998, ABR, Inc. conducted four reconnaissance evaluations of species of concern in the True North project area, and a detailed description of those findings can be found in (Anderson et al., 1995, 1996, 1997, 1998).

3.13.1 SPECIES OF CONCERN

Lynx

North American lynx occur in most of the boreal regions of northern North America, including Alaska (Tumlison, 1987). Lynx are found throughout Alaska except on the Aleutian Islands, islands in the Bering Sea and Gulf of Alaska, some islands in Prince William Sound, and on some islands in southeastern Alaska (Berrie et al., 1994). Lynx are found most often in forested habitats, including mixed spruce–hardwood forests, open spruce muskegs, and aspen–spruce woodlands, but they occur occasionally in shrub habitats (Berrie, 1973; Stephenson, 1986). Open habitats tend to be avoided by lynx (Stephenson, 1986). The primary prey of lynx is the snowshoe hare that fluctuates in abundance on an approximate 10-year cycle in interior Alaska (Wolff, 1980).

Lynx would be expected to be found in the True North project area. A lynx was seen in June 1997 near Pedro Dome, and two additional lynx sightings were reported in the area: one crossing the Old Elliott Highway at Dome Creek during April and one near the Elliott Highway where it crosses Dome Creek (Anderson et al., 1997). The large number of snowshoe hares seen in the area in 1998 suggest that lynx probably are actively using the area. Trapping records for the general area (UCU area 0208 of Game Management Unit 20B) during the past several years indicate that the lynx population was in the declining phase of the cycle through winter 1994–1995, but that the population is now rebounding, presumably in response to increasing snowshoe hare numbers in the area (Taylor 1993, 1994, 1996; Tom Seaton, ADFG, pers. comm.).

Peregrine Falcon

No Peregrine Falcons were seen during the aerial or ground surveys in the project area during the 1995 to 1998 studies. The *anatum* subspecies of the Peregrine Falcon nests in interior Alaska on river cliffs and on rock outcroppings in upland areas adjacent to rivers and larger streams (Cade, 1960, Ambrose et al., 1988). Our initial evaluation of habitats from photo-interpretation of aerial photographs of the 1998 study area indicated that these habitats do not occur in the study area, and our site visit confirmed this assessment. Thus, Peregrine Falcons are unlikely to breed, or regularly occur, in the True North project area.

The nearest nesting peregrines are on the lower Chena River near Moose Creek Dam (Roseneau et al., 1981) and on Birch and Beaver creeks (Kuropat, 1986, Ritchie et al., 1994). As populations have increased in recent years, however, peregrines have been reinhabiting their historical range in interior Alaska, and off-river (i.e., away from the Tanana

and Yukon rivers) nest sites occupied by nesting peregrines have been located in the White Mountains and other isolated upland areas (where suitable cliffs or rock outcroppings are present) to the north of the study area (Kuropat, 1986, Ritchie et al., 1994). Even given the slowly expanding breeding population in interior Alaska, it is highly unlikely that peregrines will nest in the True North area because suitable cliff-nesting habitats do not occur there.

Although Peregrine Falcons may pass through the vicinity of the proposed project occasionally during migration, there is no reason to suspect that the project area would be used regularly by migrating falcons for hunting, staging, or as a migration corridor.

Northern Goshawk

While the Northern Goshawk is not listed as a species of concern, it is considered to be a sensitive species across its range in Alaska. The goshawk is a resident raptor in interior Alaska, feeding primarily on grouse and snowshoe hares (Gabrielson and Lincoln, 1959; Zachel, 1985; Doyle and Smith, 1994; Iverson et al., 1996). In interior Alaska, McGowan (1975a) found that paper birch (*Betula papyrifera*) woodlands were the preferred nesting habitat for goshawks. Most (76%) of the nests were in birch trees; primarily on southern or western exposures. McGowan conducted his study partially in areas south of the True North project area, and his study sites comprised similar terrain and habitats. In addition, nests were found in the right-of-way corridor of the proposed Northwest Alaska Gas Line during surveys conducted in 1979–1981 (Roseneau and Bente, 1981; Ritchie 1981). This corridor paralleled the existing Trans-Alaska Pipeline System, which is located immediately to the west of the True North project area (Anderson et al., 1998).

Suitable forest types for goshawks (McGowan 1975b) occur throughout the True North project area, including mixed birch and spruce stands, and homogenous stands of aspen in the uplands and along the drainages of Spruce and Dome creeks. These forest stands constitute fair-to-high quality habitat for nesting goshawks, and do support goshawks when prey species (snowshoe hares and grouse) are present. Prey numbers in the area presently seem sufficient and snowshoe hare numbers (based on sightings and carcasses) in the True North project area have increased since 1997, and appear to be following the regional trend of increasing hare populations in interior Alaska (Taylor 1996).

Annual surveys in the True North project area from 1995 through 1998 identified three different goshawk nests (Fig. 3.8-1) (Anderson et al., 1998). One was active in 1996, another active in 1997 but inactive in 1998, and the third active in 1998. The nests were located approximately 6,500, 1,000, and

16,600 feet, respectively, from the closest point of a proposed project activity, a storage pile on the western side of the Hindenburg Pit.

Olive-sided Flycatcher

The Olive-sided Flycatcher is a small passerine bird that breeds in the boreal forests of North America (including Alaska) and winters in the forests of Central and South America (Gabrielson and Lincoln, 1959; AOU, 1983; Willis et al., 1993). In general, neotropical migrant birds (i.e., those birds that breed in North America and migrate long distances to winter in the Central and South American tropics) appear to be declining in abundance in their breeding ranges in North America, particularly the eastern United States and Canada (Sauer and Droege, 1992). A major cause of these declines appears to be deforestation and habitat alterations to the tropical broadleaf forests used by these birds, including the Olive-sided Flycatcher, in their wintering areas (Petit et al., 1993).

In interior Alaska Olive-sided Flycatchers usually breed in forested habitats, particularly coniferous forests dominated by black spruce, although they also can be found in low numbers in mixed deciduous–coniferous forests (Spindler, 1976; Spindler and Kessel, 1978; Kessel et al., 1982; ABR, 1987). Kessel (1979) identified scattered woodlands (trees ≥5 m tall) and dwarf forest (trees <5 m tall) as typical habitats of the Olive-sided Flycatcher

Surveys in the True North project area from 1996 to 1998 identified several Olive-sided Flycatchers each year (Fig. 3.8-1) (Anderson et al., 1995, 1996, 1997, 1998). Most of these birds were in needleleaf forests. The results of the surveys indicate that Olive-sided Flycatchers generally are present wherever suitable habitats occur in the True North project area. As shown in Figure 3.8-1, two territories are located in areas that would be disturbed by the proposed project pits or stockpiles, and an additional two or three are located within approximately 4,000 feet of such disturbance.

Harlequin Duck

The Harlequin Duck is a sea duck that breeds primarily in the coastal habitats of the Pacific Northwest and along fast-moving streams in the mountains of interior Alaska and western Canada (Bellrose, 1978). Harlequin Ducks are common in coastal areas of southeastern and southcentral Alaska and in the Aleutians, but are less common north of the Alaska Peninsula and in interior Alaska (Gabrielson and Lincoln, 1959). Records summarized by Gabrielson and Lincoln indicate that Harlequin Ducks have been recorded in the swift upper tributaries of Beaver Creek. More recently, harlequins have been reported breeding along the Fortymile River and along fast-moving streams in the White Mountains (D. D. Gibson, Univ. Alaska Museum, Terrestrial Vertebrates Collection, pers. comm.). Gibson also indicated that Harlequin Ducks, although not common, are likely to occur in all suitable habitats in interior Alaska that are undisturbed by human activities.

Anderson et al. (1998) indicated that habitats suitable for Harlequin Ducks (primarily swift-moving streams) do not occur in the True North project area. Thus, it is extremely unlikely that this species would occur in these areas. In addition, Anderson et al. (1998) stated no site records of this species have been reported in the area (D. D. Gibson, pers. comm.).

Plants

Four of the five plant species of concern (Cryptantha shackletteana, Draba *murrayi*, *Eriogonum flavum* var. *aquilinum*, and *Podistera yukonensis*; Table 3.13-1) occur in interior Alaska, but are restricted to steep, south-facing bluffs composed of steppe-like vegetation overlying well-drained eolian silts (Murray and Lipkin, 1987; C. Parker, Univ. Alaska Museum, Herbarium Collection, pers. comm.). Dry, south-facing bluffs supporting this plant community type are not present in the True North project area. The fifth plant species (*Aster yukonensis*) occurs on well-drained river and stream banks and river delta gravels, but has been found only along the Koyukuk River drainage in the Brooks Range and near Kluane Lake in the Yukon (Murray and Lipkin, 1987).

3.14 AIR QUALITY

3.14.1 METEOROLOGICAL CONDITIONS

The project area is near the center of the climatological division known as the Interior Basin of Alaska. This part of Alaska has extreme seasonal variations in temperature. Daily minimum readings drop to 0°F or colder more than 75 percent of the days from November 1 to March 31 (U.S. Department of Agriculture, 1963). Daily maximum readings reach 70°F or higher about 56 percent of the days in July and August. Temperatures can reach 90°F or higher at some time approximately 20 percent of the days during the growing season (FGMI, 1993).

Precipitation data for Fairbanks indicate that historically the wettest months are June, July, August, and September (National Oceanic and Atmospheric Administration, 1989). August, the wettest month, has a mean precipitation of 1.86 inches. The driest months are February, March, and April. With a mean precipitation of 0.27 inches, April is the driest month. Annual mean precipitation for Fairbanks is 10.37 inches (FGMI, 1993).

Interior Alaska is dominated by high pressure 7 to 8 months of the year and by low pressure during the summer months. Daily sunlight varies from less than 3.5 hours to more than 20 hours (FGMI, 1993).

The project area is characterized by low cloud cover and light winds. In winter, the high pressure results in calm wind conditions. On an annual basis, the regional wind pattern is from the north, except during June and July, when it is from the southwest. Annual regional wind speed is approximately 5 miles per hour (FGMI, 1993).

These meteorological and climatological conditions suggest that the Fairbanks area is characterized by limited atmospheric-mixing conditions. Strong ground-based inversions in winter further inhibit vertical dispersion of air emissions.

Because the project area is located in hilly terrain, local meteorological conditions could differ from regional climatology.

3.14.2 EXISTING AIR QUALITY

Air quality is regulated through ambient air quality standards and enforcement of emission limits for individual sources of air pollution. The federal Clean Air Act required EPA to identify National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. These standards have been established for TSP, particulate matter (PM_{10}), ozone (O_3), carbon monoxide (CO), SO_2, nitrogen dioxide (NO_2), and lead (Pb). The State of Alaska has adopted the NAAQS. These standards are presented in Table 3.14-1 (FGMI, 1993).

On the basis of air quality data collected at Fairbanks, and recognizing that the True North project area is away from any populated or industrial area, concentrations of criteria pollutants are expected to be lower than corresponding values reported in Fairbanks, and certainly would ot approach the NAAQS standards. Because the project area is substantially above the elevation of Fairbanks, temperature inversions and associated ice fog are not expected to occur at the project site (FGMI, 1993). Table 3.14-2 shows typical air pollutant background concentrations in rural Fairbanks.

Table 3.14-1 **National Ambient Air Quality Standards**			
Pollutant	**Averaging Time**	**Primary (Health)**	**Secondary (Welfare)**
Total suspended particulates (TSP)	Annual arithmetic mean	NA	60 $\mu g/m^3$
	24 hours	NA	150 $\mu g/m^3$
Particulate matter less than 10 μm diameter (PM_{10})	Annual arithmetic mean	50 $\mu g/m^3$	50 $\mu g/m^3$
Ozone (O_3)	1 hour	0.12 ppm	0.12 ppm
Carbon monoxide (CO)	8 hours	9 ppm	9 ppm
	1 hour	35 ppm	35 ppm
Sulfur dioxide (SO_2)	Annual arithmetic mean	0.03 ppm	NA
	24 hours	0.14 ppm	NA
	3 hours	NA	0.5 ppm
Nitrogen dioxide (NO_2)	Annual arithmetic mean	0.053	0.053
Lead (Pb)	Calendar quarter	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$

Table 3.14-2 **Typical Air Pollutant Background Concentrations In Rural Fairbanks**		
Pollutant	**Averaging Time**	**Concentrations**
TSP	Annual	Not available
	24 hour	42 $\mu g/m^3$
O_3	1 hour	0.05 ppm
CO	1 hour	Less than 5.0 ppm
	8 hour	Less than 1.0 ppm
SO_2	1 hour	Less than 0.01 ppm
	3 hour	Essentially the same as for 1 hour

Source: MacKenzie and Arnold, 1973; Coutts, 1979

3.15 NOISE AND VIBRATION

This discussion of the existing noise and vibration environment in the True North project area has been taken from the True North noise and vibration analysis contained in Minor & Associates (2000). Greater detail about methods of sound measurement and type of equipment used may be found in that document.

3.15.1 INTRODUCTION

Human response to noise is subjective and can vary greatly from person to person. Factors that can influence individual response include the loudness, frequency, the amount of background noise present before an intruding noise and the nature of the work or activity (e.g., sleeping) that the noise affects.

The unit used to measure the loudness of noise is the decibel (dB). To better approximate the sensitivity of the human ear to sounds of different of frequencies, the A-weighted decibel scale was developed. Because the human ear is less sensitive to higher and lower frequencies, the A-weighted scale reduces the sound level contributions of these frequencies. When the A-weighted scale is used, the decibel levels are denoted as dBA.

A 10-dBA change in noise levels is judged by most people as a doubling of sound level. The smallest change in noise level that a human ear can perceive is about 3 dBA, and increases of 5 dBA or more are usually noticeable. Normal conversation ranges between 44 and 65 dBA when speakers are 3 to 6 feet apart.

Noise levels in a quiet rural area at night are typically between 32 and 35 dBA. Quiet urban nighttime noise levels range from 40 to 50 dBA. Noise levels during the day in a noisy urban area are frequently as high as 70 to 80 dBA. Noise levels above 110 dBA become intolerable and then painful, while levels higher than 80 dBA over continuous periods can result in hearing loss. Constant noises tend to be less noticeable than irregular or periodic noises.

Table 3.15-1 provides some common noise sources with relative loudness and decibel rating.

3.15.2 Sound Propagation Characteristics

There are several factors that determine how sound levels reduce over distance. Under ideal conditions, a point noise source in free space will attenuate at a rate of 6 dB per doubling of distance (using the inverse square law). An ideal line source (such as constant flowing traffic on a busy highway) reduces at a rate of approximately 4.5 dB per doubling of distance. Under normal conditions however, noise sources are usually some combination of the two examples resulting in sound attenuation which lies somewhere between the two ideal reduction factors. Other factors that affect the attenuation of sound with distance include existing structures, topography, foliage, ground cover, and atmospheric conditions such as wind, temperature, and relative humidity. The following sections provide some general information on the potential affects of each of the factors on sound attenuation.

Existing Structures -- Existing structures can have a substantial affect on noise levels in any given area. Structures can reduce noise by physically blocking the sound transmission, and in some circumstances, can cause an increase in noise levels if the sound is reflected off the structure and transmitted to a nearby receiver location. Measurements have shown that a single story house has the potential, through shielding, to reduce noise levels by as much a 10 dB or greater. The actual noise reduction will depend greatly on the geometry of the noise source, receiver, and location of the structure. Increases in reflected noise are normally kept to 3 dB or less.

Topography -- Topography includes existing hills, berms, and other surface features between the noise source and receiver location. As with structures, topography has the potential to reduce or increase sound depending on the geometry of the area. Hills and berms when placed between the noise source and receiver can have a significant effect on noise levels. In many situations, berms are used as noise mitigation by physically blocking the noise source from the receiver location. In some locations, however, the topography can result in an overall increase in sound levels by either reflecting or channeling the noise towards a sensitive receiver location.

Foliage -- Foliage, if dense, can provide slight reductions in noise levels. The Federal Highway Administration (FHWA) provides for up to a 3 dBA reduction in traffic noise for locations with at least 30 feet of dense foliage that contains leaves year around. Because of the varying foliage in the project area, a minimal reduction for foliage was used in the analysis.

Ground Cover -- The ground cover between the receiver and the noise source can have a significant affect on noise transmission. For example, sound will travel very well across reflective surfaces such as water and pavement, but can be attenuated when the ground cover is field grass, lawns or loose soil. Appropriate ground coverage was used in the analysis, including powder snow, granular snow, and field grass.

Atmospheric Conditions -- Atmospheric conditions that can have an effect on the transmission of noise include wind, temperature, humidity and precipitation. Wind can increase sound levels if it is blowing from the noise source to the receiver, and conversely, can reduce noise levels if blowing in the opposite direction. Temperature, by itself, normally would have a small affect on noise levels; however, project area temperatures can vary from –40o F to 70o F. In addition, atmospheric conditions have the most noticeable affect on receivers located over 250 feet from the noise source, which is the case in the project area. Temperature variations of this magnitude, when grouped with humidity and pressure, can have a noticeable impact on noise levels as measured at distant receiver locations. Historical atmospheric conditions used in the analysis were obtained from the Fairbanks National Weather Service.

3.15.3 NOISE LEVEL DESCRIPTORS

General mining operational noise levels used in this analysis (with the exception of blast noise) are stated as sound pressure levels, in terms of decibels on the A-scale (dBA). The A-scale is used in most ordinances and standards including the applicable standards for this project. To account for the time-varying nature of noise several noise metrics are useful. The equivalent sound pressure level (L_{eq}) is defined as the average noise level, on an energy basis, for a stated time period (for example, hourly).

Other commonly used noise descriptors include the L_n, L_{max}, and L_{min}. The L_{max} and L_{min} are the greatest and smallest root-mean square (RMS) sound levels, in dBA, measured during a specified measurement period. The sound level descriptor L_n is defined as the sound level exceeded "n" percent of the time. For example, the L_{25} is the sound level exceeded 25 percent of the time; therefore, during a 1-hour measurement, an L_{25} of 60 dBA means the sound level equaled or exceeded 60 dBA for 15 minutes during that hour.

3.15.4 EXISTING LAND USE AND AMBIENT NOISE LEVELS

This section provides details on the area land use survey and noise monitoring. Thirteen locations were selected for the noise survey; six locations were primarily short-term monitoring and the other seven locations were long term unattended sites.

Project Area Land Use

Land use within a 5-mile radius of the True North Mine site includes residential, commercial, light and heavy industrial, as well as undeveloped lands. Major noise sources include existing mining operations, heavy truck traffic on the Elliott and Steese highways, snow machines in the winter, sled dog teams and tour buses in the summer months. Other less notable sources include passenger traffic and miscellaneous residential and commercial activities.

West and north of True North Mine site

Directly west of the proposed mine site is the Olnes East Subdivision. The Olnes East subdivision is located east of the old Elliott Highway, approximately 7 to 8 miles north of the intersection of the Elliott and Steese highways. The area is divided in to what recent FNSB CAD files show as over 60 individual lots. Several occupied single-family residences exist in this area. Distances between this development and the proposed mine site vary from approximately 5,000-feet at the east end of the subdivision to 12,000-feet at the west end of the subdivision. An additional 30 to 35 lots also were identified at the Olnes West subdivision, which is located on the west side of the Elliott Highway. The Olnes area is the closest residential area to the proposed mine site.

Two other nearby residential areas exist on the west side of the Elliott Highway in the same vicinity and south of the Olnes subdivisions. One group of approximately 30 lots is located along Babe Creek Drive, Treasure Street, and Wildcat Creek Way, all located off Vault Drive west of the Elliott Highway. The distance to the proposed mine site from this group of residents is approximately 15,500-feet. A second subdivision, located north of Wildcat Creek Way named Wanda's Acres, also is approximately 15,500-feet from the proposed mine site.

With the exception of some individual residents on otherwise undeveloped lands, the only other identified major residential area northwest of the proposed mine site is the Haystack Subdivision located along Haystack Ridge. The closest residents in this area are approximately 18,800-feet to 19,200-feet from the proposed site and, even though at this distance mine related noise is not expected to be audible, the area is included in this analysis.

East of True North

East of the proposed True North Mine site, along the Pedro Dome / True North Road and near the Clearly Summit area, there are several single-family residential areas and a ski resort. Approximately 35 residential lots were identified along Pedro Dome / True North Road, Ridge Run Road, and Rock Run Road. This residential area is approximately 17,600-feet to 18,800-feet from the mine site in the Cleary Summit Subdivision and is well shielded by the Pedro Dome Ridge. Another residential area, the Skiland Subdivision, is located east of the Steese Highway, over 22,000 feet from the mine site. As with the Cleary Summit Subdivision, residents of the Skiland Subdivision also are shielded from the True North mine site by Pedro Dome Ridge.

Several other single family residents also are located east/southeast of the mine site closer to the Steese and Elliott highways intersection at Fox, however, all of these residents are over 23,000-feet from the site and are well shielded by the existing topography and therefore not expected to have noticeable noise level increases related to the True North project.

3.15.5 EXISTING NOISE LEVEL SURVEY

Monitoring locations were selected based on the ability to gain access and to accurately document a group of nearby noise sensitive land uses. Other considerations, such as topography and existing noise sources also played a part in site selection. Based on the on-site investigation and site review, 13 locations were selected for noise monitoring.

For the purpose of performing the noise analysis, the noise monitoring was divided into two groups; locations that could be affected by activities at the True North mine site, and locations that could be affected by trucks on the ore haul route. Six monitoring locations were selected to represent the nearby residential areas for the analysis of True North Mine operations. Locations selected were two sites along the Elliott Highway, one in the Olnes Subdivision, one in the Haystack Subdivision, one near Pedro Dome, and one near Cleary Summit. Figure 3.15-1 shows the approximate location of the six monitoring sites used for the analysis of True North mine operations.

An additional seven locations were used to represent receivers near the proposed ore haul route. The monitoring locations were near the haul route in the Cleary Summit and Skiland residential subdivisions. Two locations were selected in the Cleary Summit Subdivision with an additional five locations selected in the Skiland Subdivision. Figure 3.15-2 shows the seven monitoring locations selected near the proposed haul route.

Because of extreme temperatures during January 2000 of minus 35 to minus 45 degrees F, all winter monitoring sessions were performed on a short-term, on-site basis. The benefit of performing short-term monitoring is that personnel on-site can make notes of existing noise sources, and take short special readings that can be used to approximate the expected nighttime noise levels. The winter data was only taken at the six representative sites selected for True North Mine operational noise (Fig. 3-15.1). No winter monitoring was performed at the sites along the proposed ore haul route because selection of the preferred route had not been made. For the purpose of the analysis and associated discussion, the term daytime is defined as 7:00 am to 10:00 pm and nighttime is defined as 10:00 pm to 7:00 am.

Short-term noise monitoring was also performed during the summer between July 10 and July 13, 2000 at each of the six sites selected for True North Mine operational noise. In addition to the short-term monitoring, summer long term unattended noise monitoring was also performed at the seven locations selected near the ore haul route (Fig. 3-15-2).